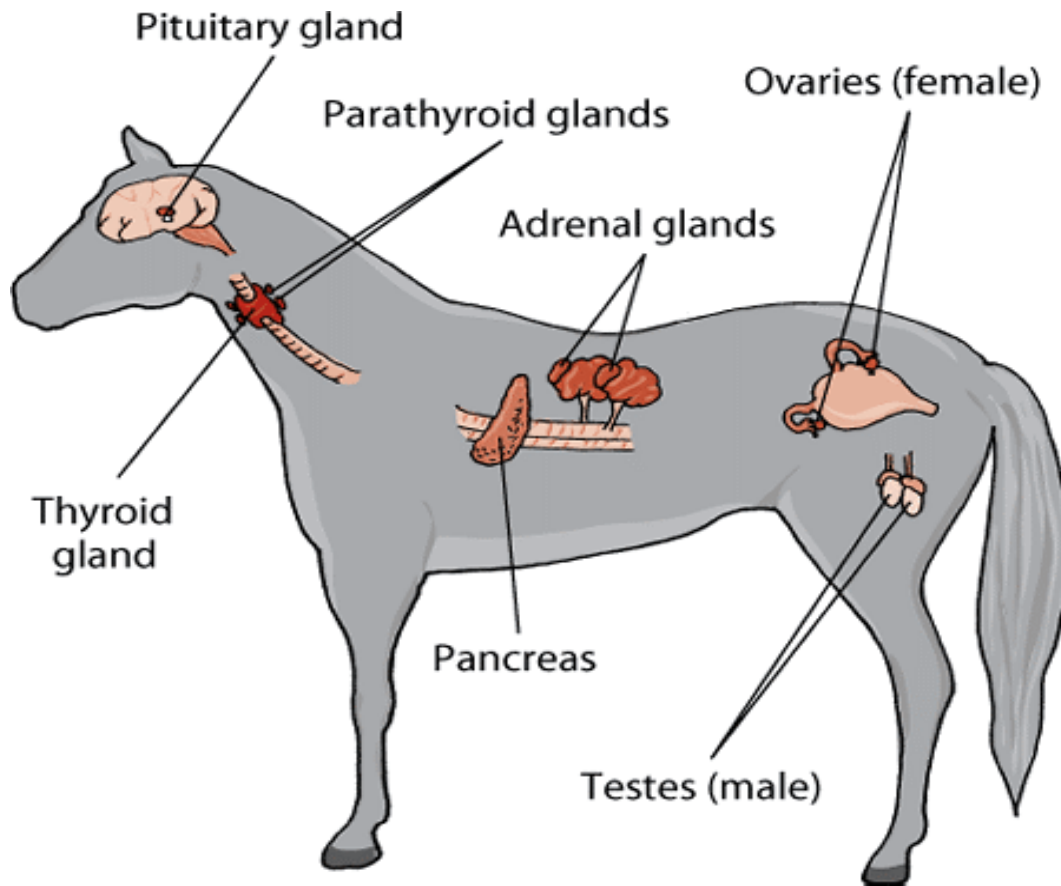


# Endocrine System



**Dr. A.M.J.B. Adikari**

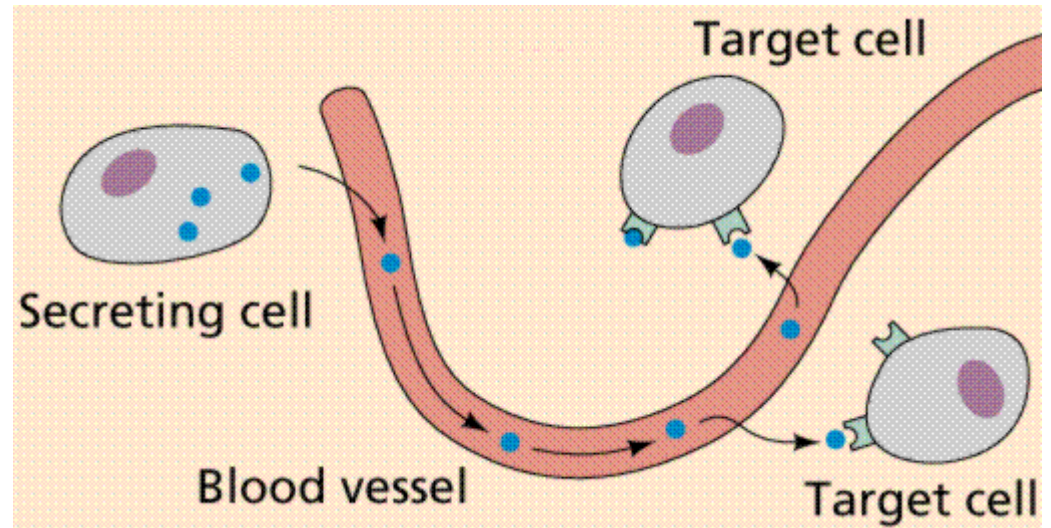
**Dept. of Animal and Food Sciences**

# Endocrine System

- The endocrine system consists of
  - Endocrine **cells**                      – hormone secreting cells
  - Endocrine **glands**                      – hormone secreting organs
- Specific target cells respond to specific hormones
- One of the main controlling systems

# Hormones

- A chemical substance
- Produce - restricted area
- Diffuses - extracellular space
- It influences activity & tends to integrate component parts

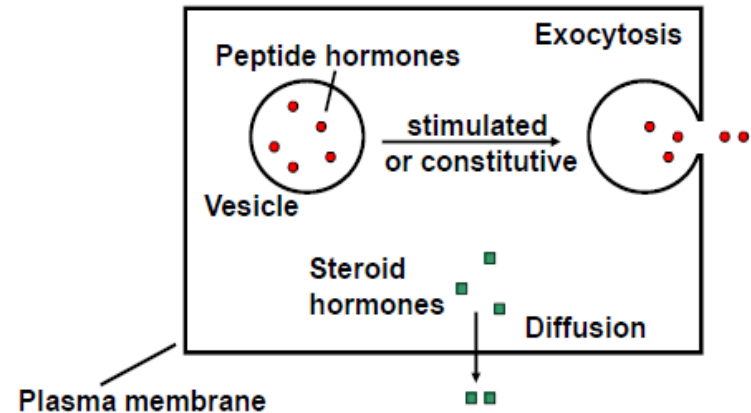


# Functions of hormones

- Homeostasis - Control internal environment
- Growth and Development
- Reproduction
- Energy Metabolism
- Behavior

# Chemical classes of hormones

- Peptides (protein)
  - Large molecular weight
  - Water soluble
- Steroid
  - Small molecular weight
  - Lipid soluble



# Mechanism of hormone action

- Target cells
  - Respond to the effects of a hormone
- Receptors
  - Interacts with hormone
  - Cell surface /intra cellular location
  - Functionally couples to enzymes

Receptor + Hormone

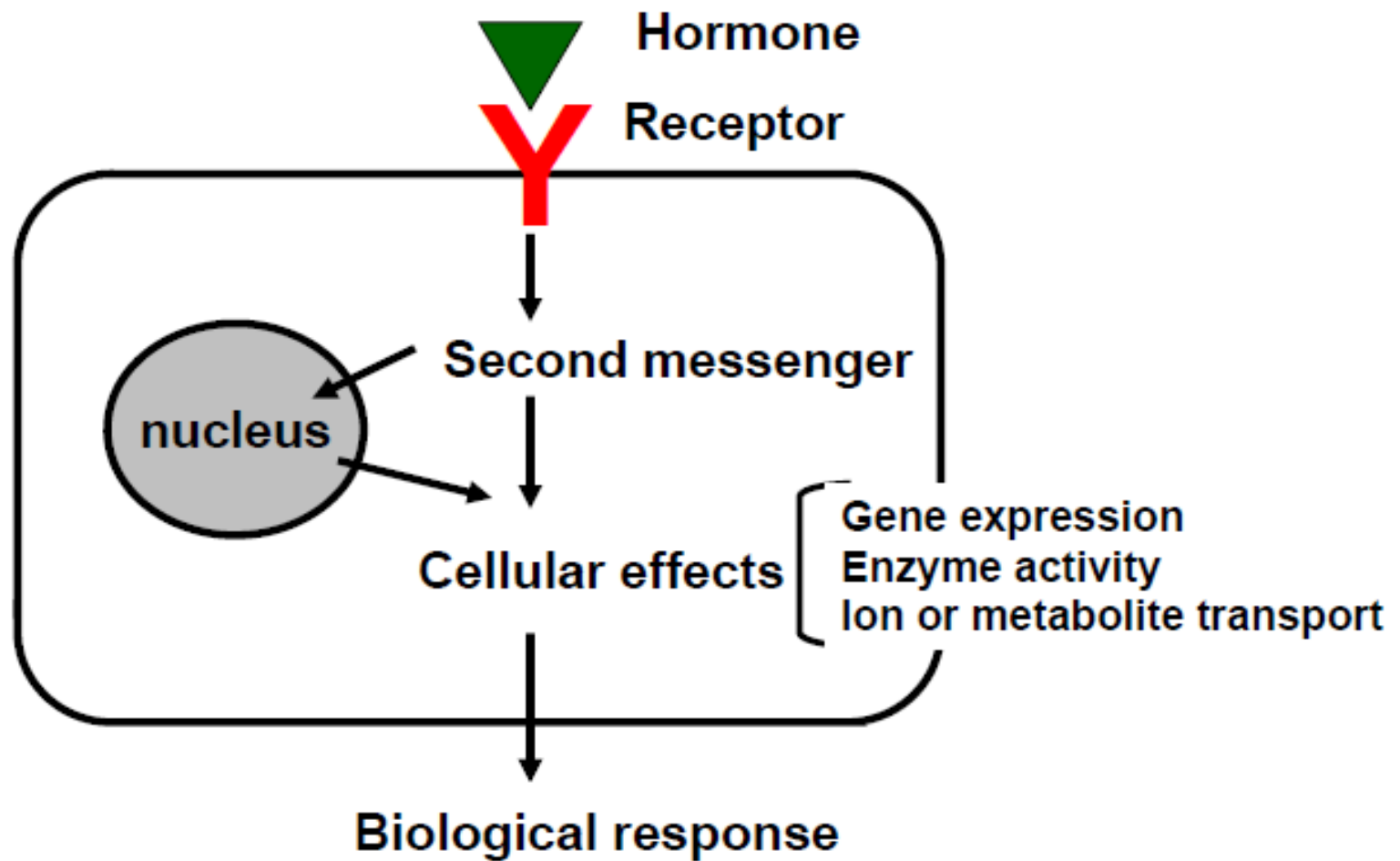


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graph TD; A[Receptor + Hormone] --> B[Receptor - hormone complex]; B --> C[Activate enzymes in the cell]; C --> D[Alter the cell functions];
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Receptor – hormone complex

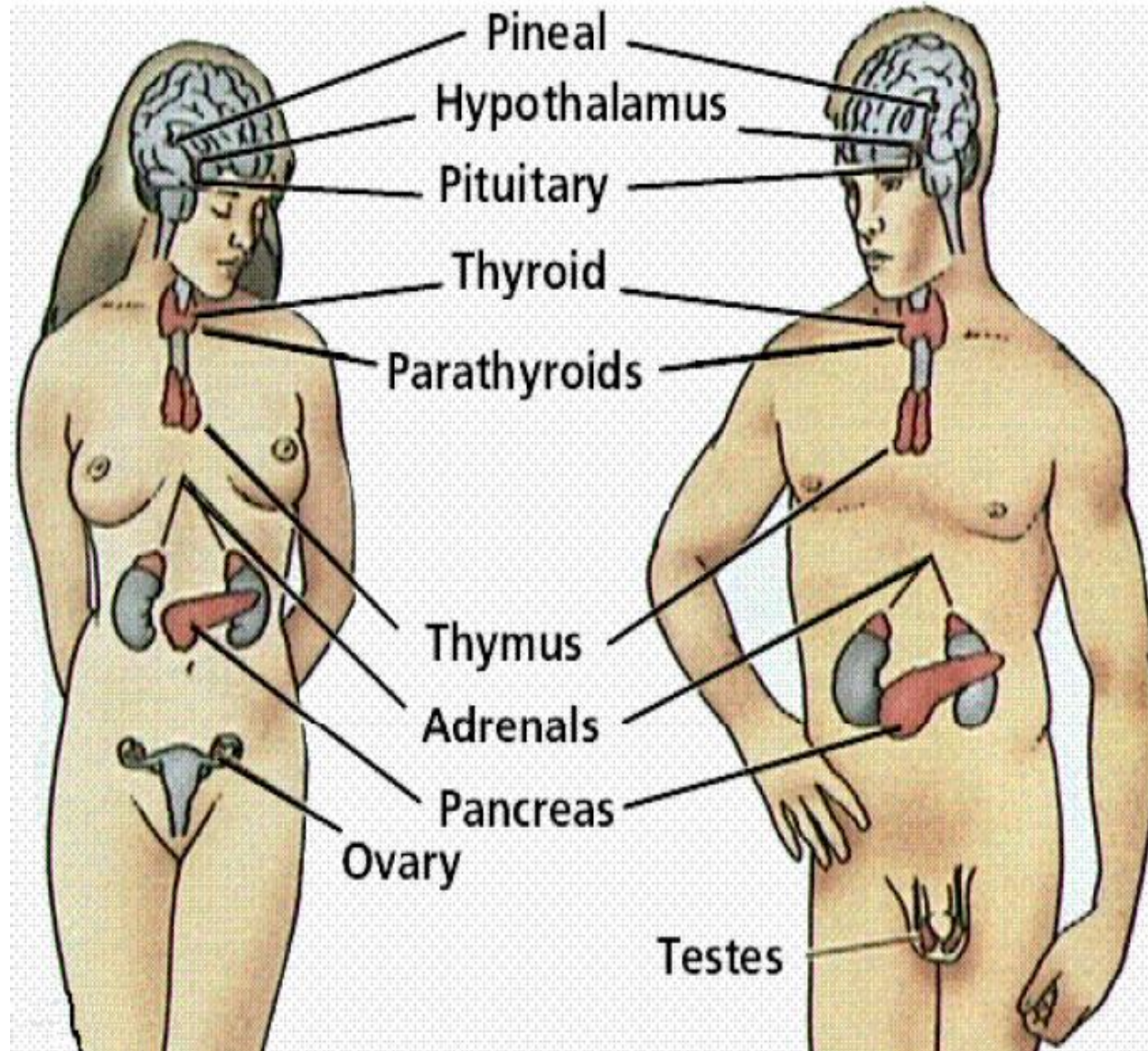
Activate enzymes in the cell

Alter the cell functions

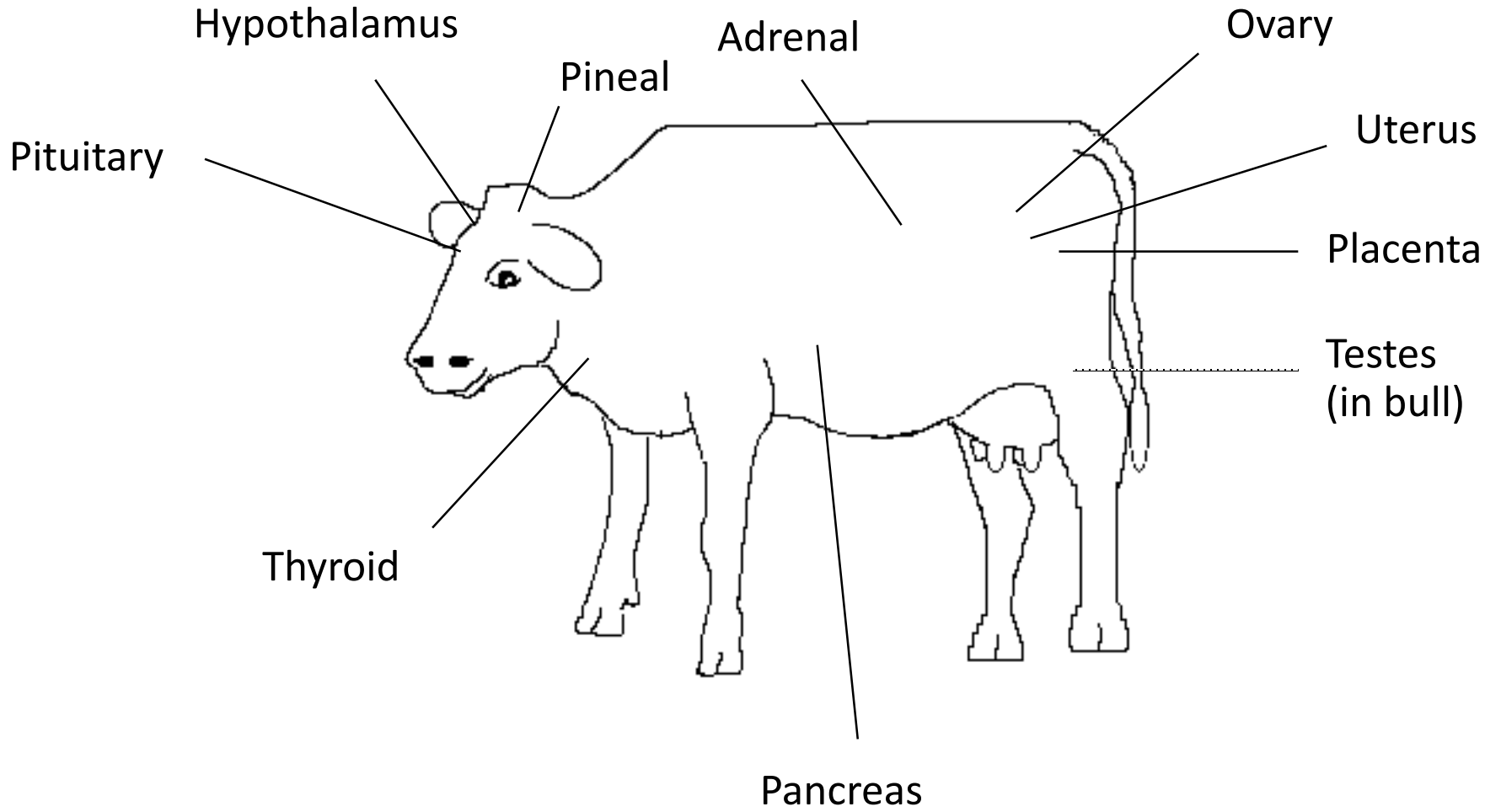




# Major endocrine glands



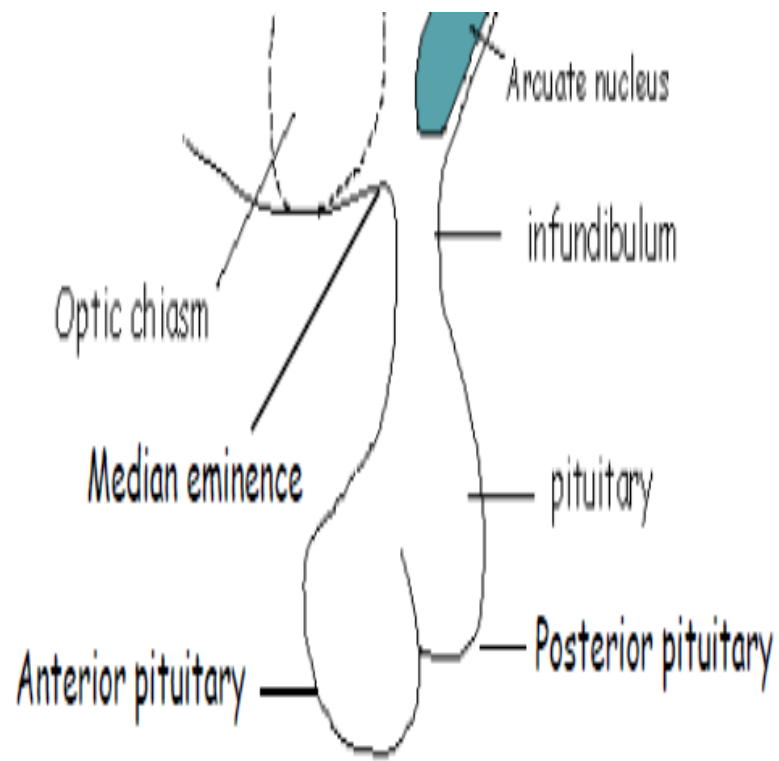
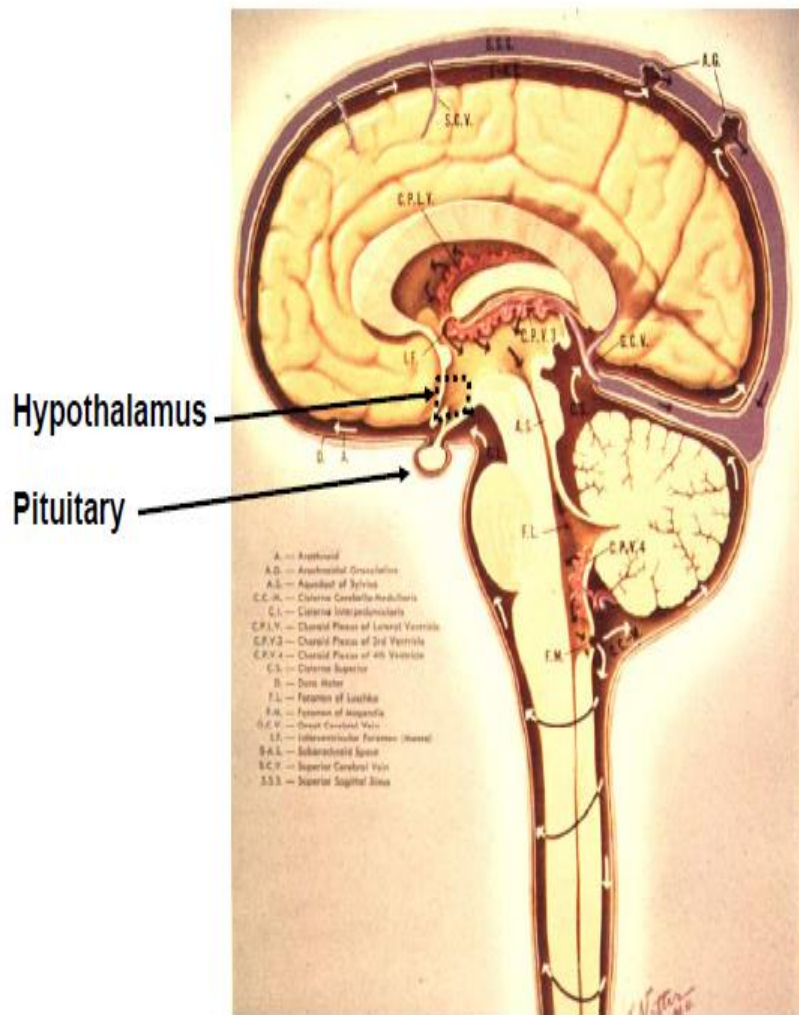
# Endocrine Glands

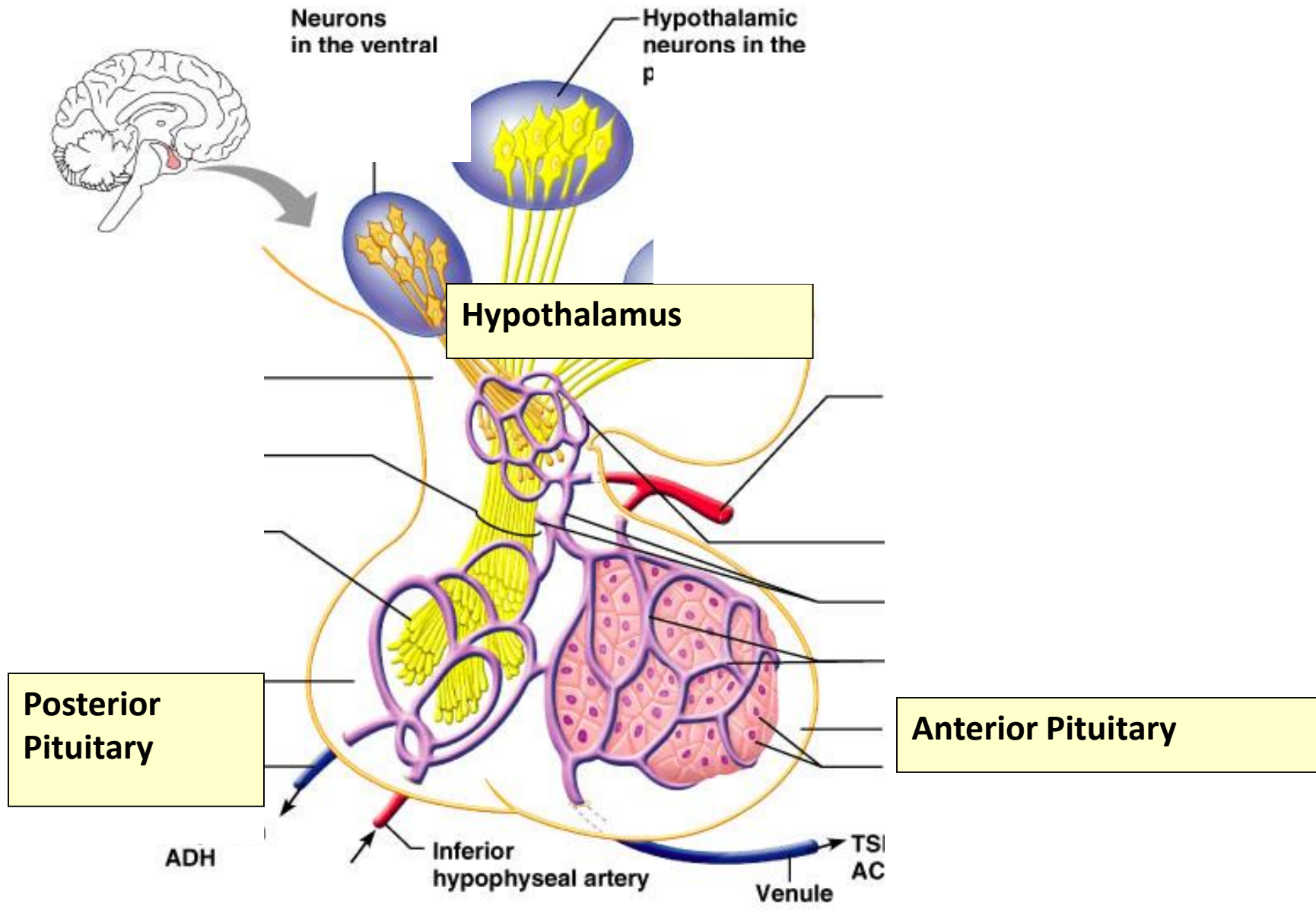


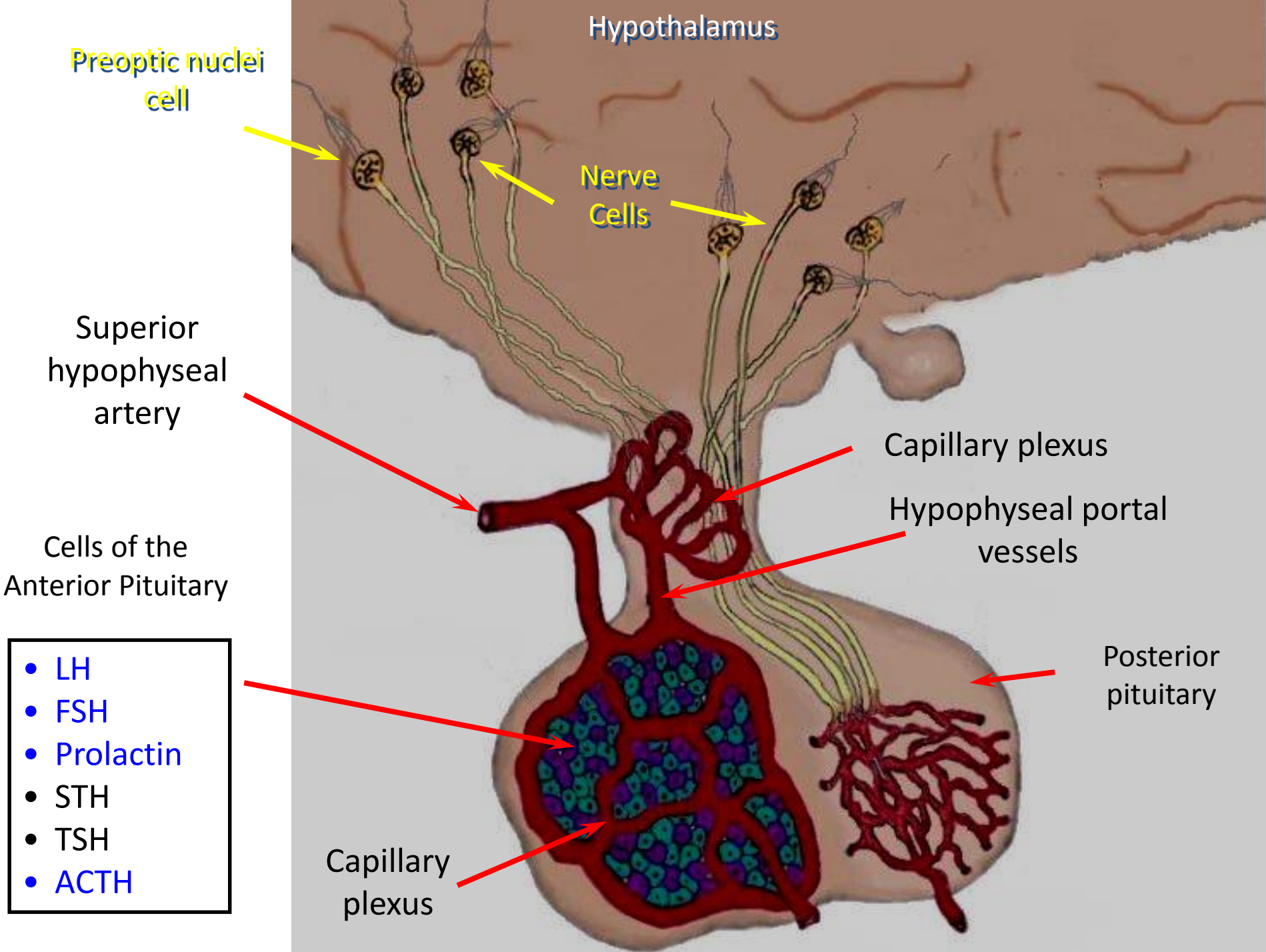
# Endocrine glands

- **Pituitary (master glands)**

- Small, round structure, attached to the hypothalamus
- Two structural & functional divisions
  - Anterior lobe
  - Posterior lobe (Neurohypophysis)







- **Anterior lobe**

- 75% of weight

- Glandular

- Hormones - GH, FSH, LH (GTH), TSH, ACTH, PRL & MSH

- **Posterior lobe (Neurohypophysis)**

- 25% weight

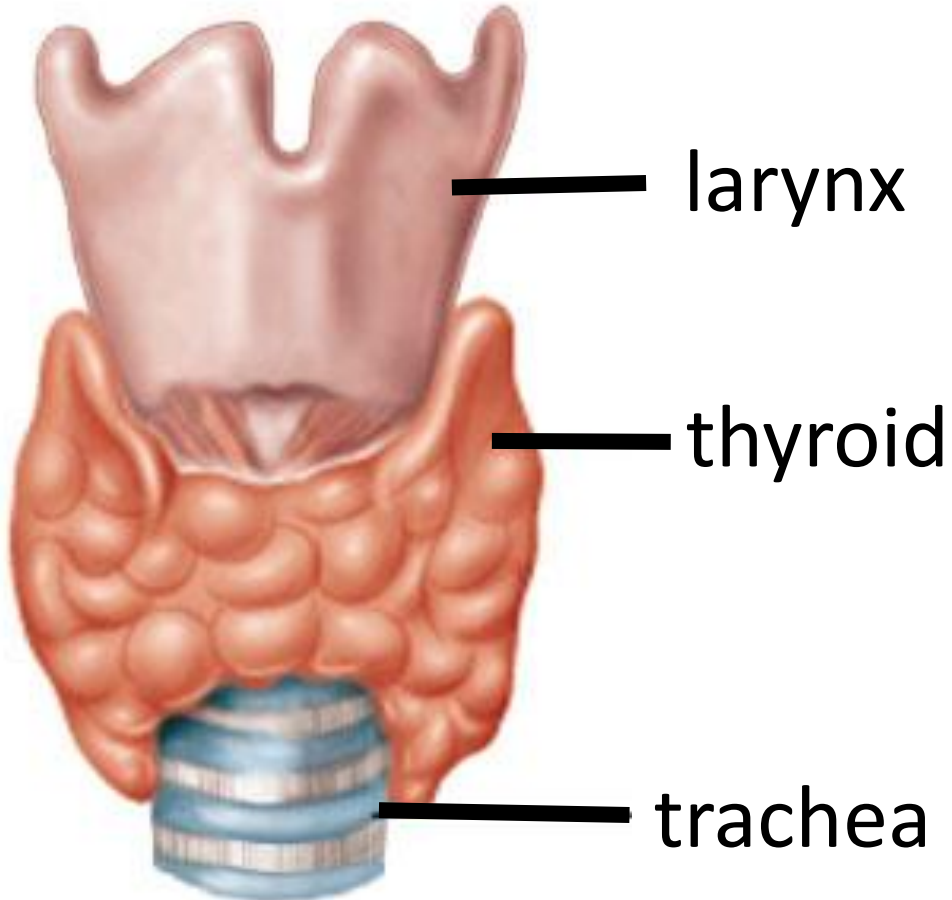
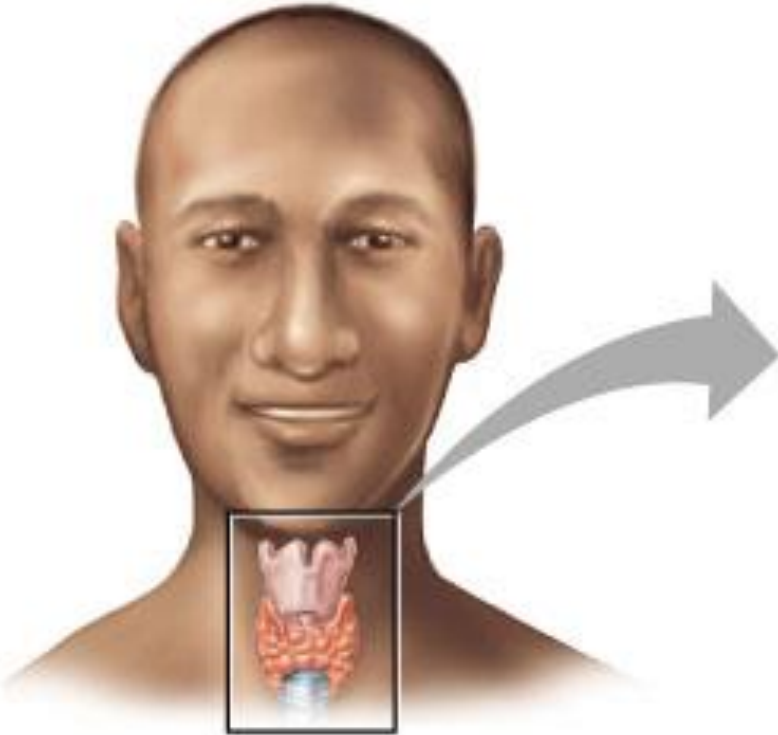
- Hormones - Oxytocin, ADH

<b>Hormone</b>	<b>Action</b>	<b>Regulations</b>
<b>GH</b>	Growth of body cells. Protein anabolism	<b>GHRF, GHIF</b>
<b>TSH</b>	Stimulation of thyroid	<b>TRF</b>
<b>ACTH</b>	Stimulation of adrenal cortex function	<b>CRF</b>
<b>FSH</b>	Initiate development of follicles, induce testosterone secretion, stimulate spermatogenesis	<b>GNRH</b>
<b>LH</b>	Stimulates ovulation, CL formation, stimulate leydig cell development, testosterone production	<b>GNRH</b>
<b>PRL</b>	Lactogenesis, maintenance of milk secretion	<b>PIF, PRF</b>
<b>MSH</b>	Stimulate melanin dispersion	<b>MRF, MIF</b>



<b>Hormone</b>	<b>Action</b>	<b>Regulations</b>
OT	Stimulate smooth muscle contraction (labour and milk ejection)	<b>Nipple stimulation, Uterine distension</b>
ADH	Water retention of kidney tubules (low urine volume, High BP)	Low water in blood

# Thyroid Gland



**Anterior  
(front)**

- **Thyroid gland**

- Two lobed, oval shaped

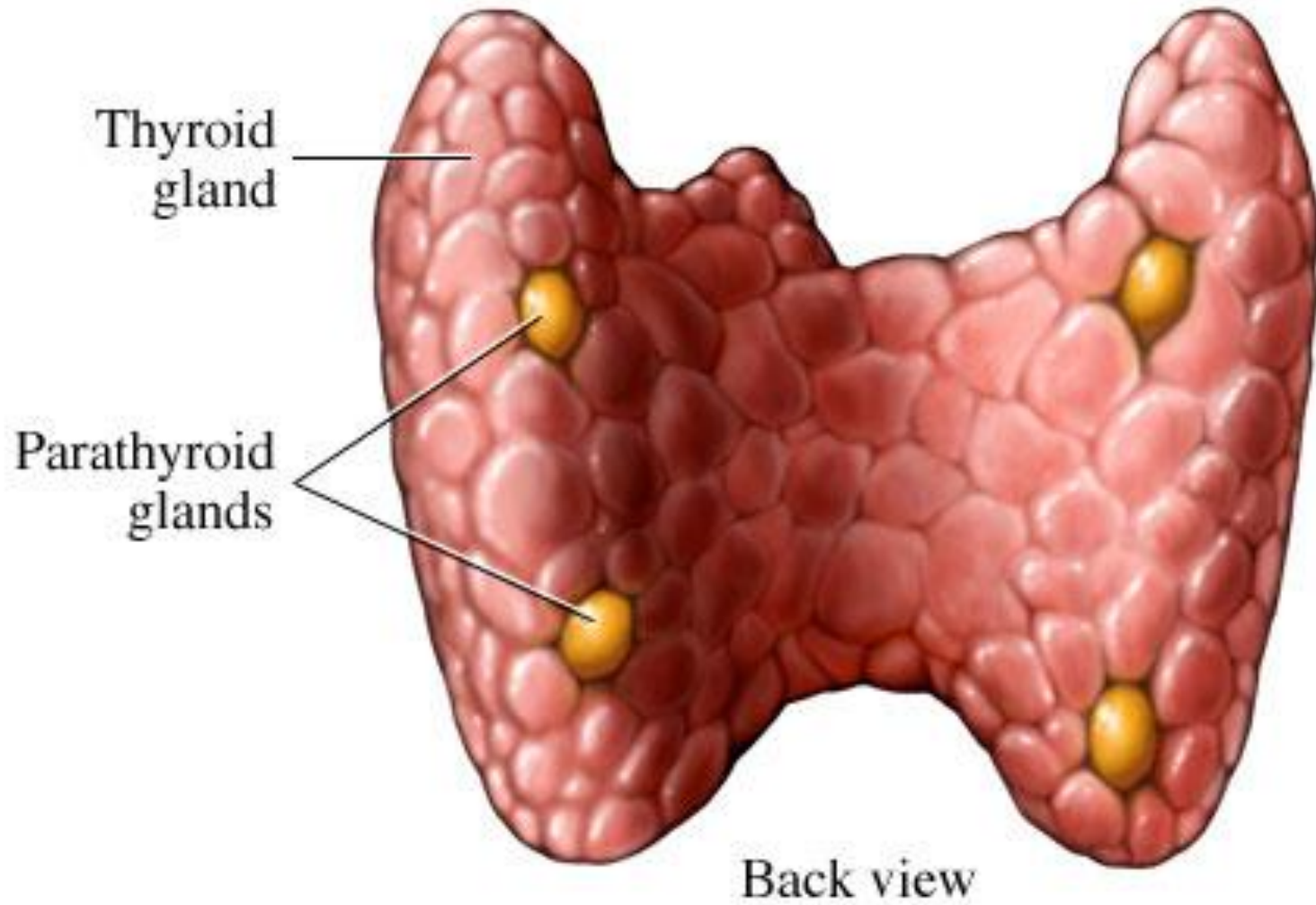
- Located below the larynx

- Composed of thyroid follicles/follicular cells (T3 &T4)  
& para follicular cells (Calcitonin (CT))

- Formation, storage & release of thyroid hormones
- T3- Tri-iodo thyronine
- T4 – tetra-iodo thyronine – Thyroxine
- T3 potency > T4
- Secretion rate T4 > T3
- Regulation of CHO and lipid catabolism
- NS development, growth and development

- Calcitonin (CT)
  - Regulate calcium homeostasis
  - Promotes blood  $\text{Ca}^{+2}$  uptake
  - Low  $\text{Ca}^{+2}$  & gastrin stimulate secretion of calcitonin

# Parathyroid gland



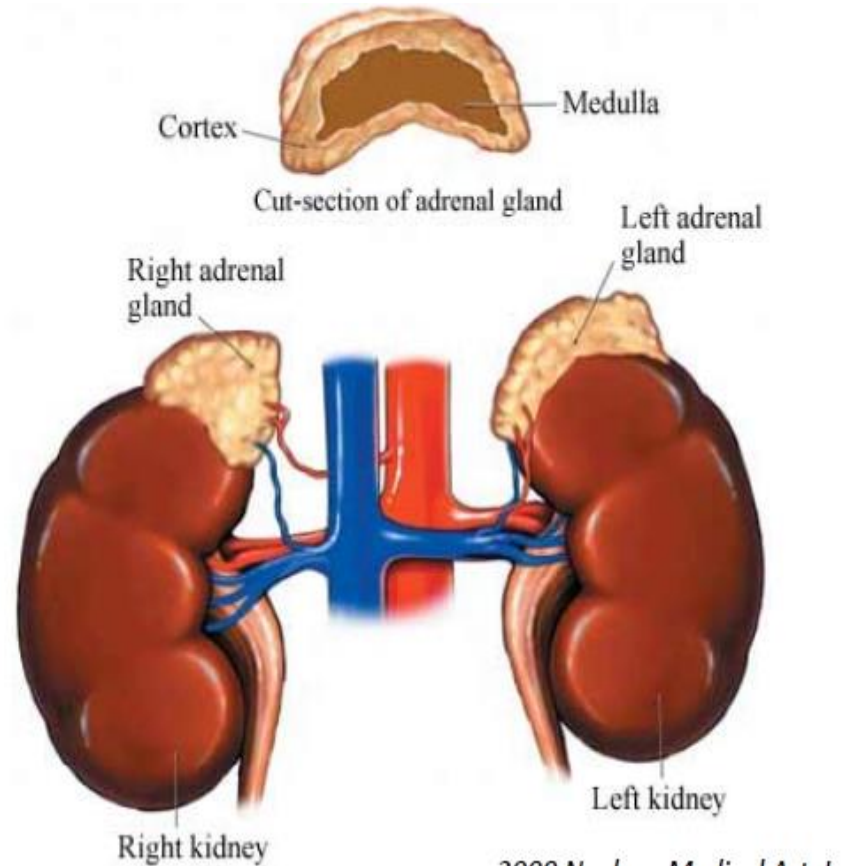
# Parathyroid

- Embedded on thyroid
- Chief cells - PT hormone
- Oxyphil cells - reserve hormone
- $\text{Ca}^{+2}$  and  $(\text{PO}_4)^{-3}$  homeostasis
- Activates Vit. D elimination through Urine

# Adrenal (supra renal)

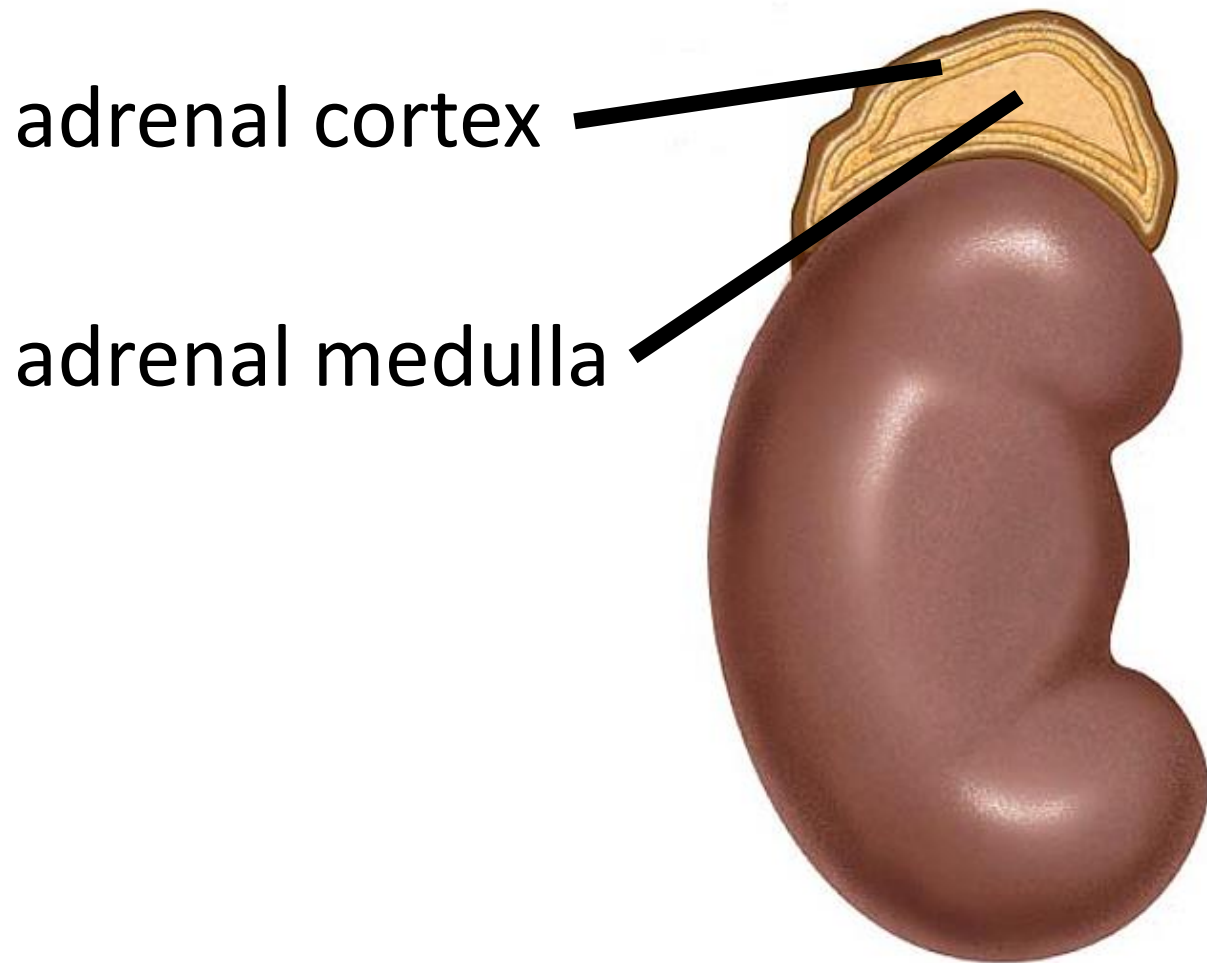
2 regions

- **Cortex**
- **Medulla**
  - **Epinephrine**
  - **Nor-epinephrine**

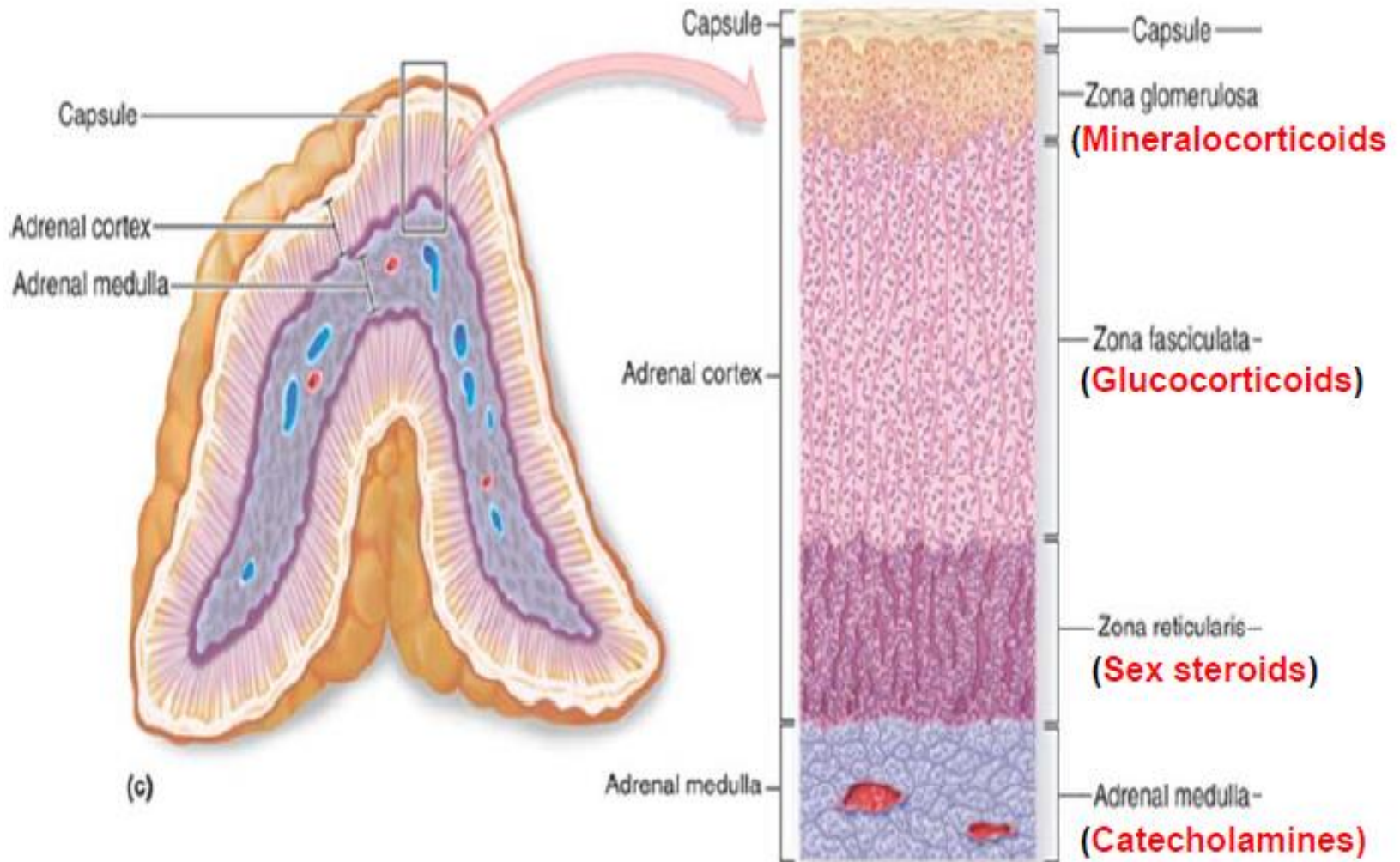




# Adrenal Glands

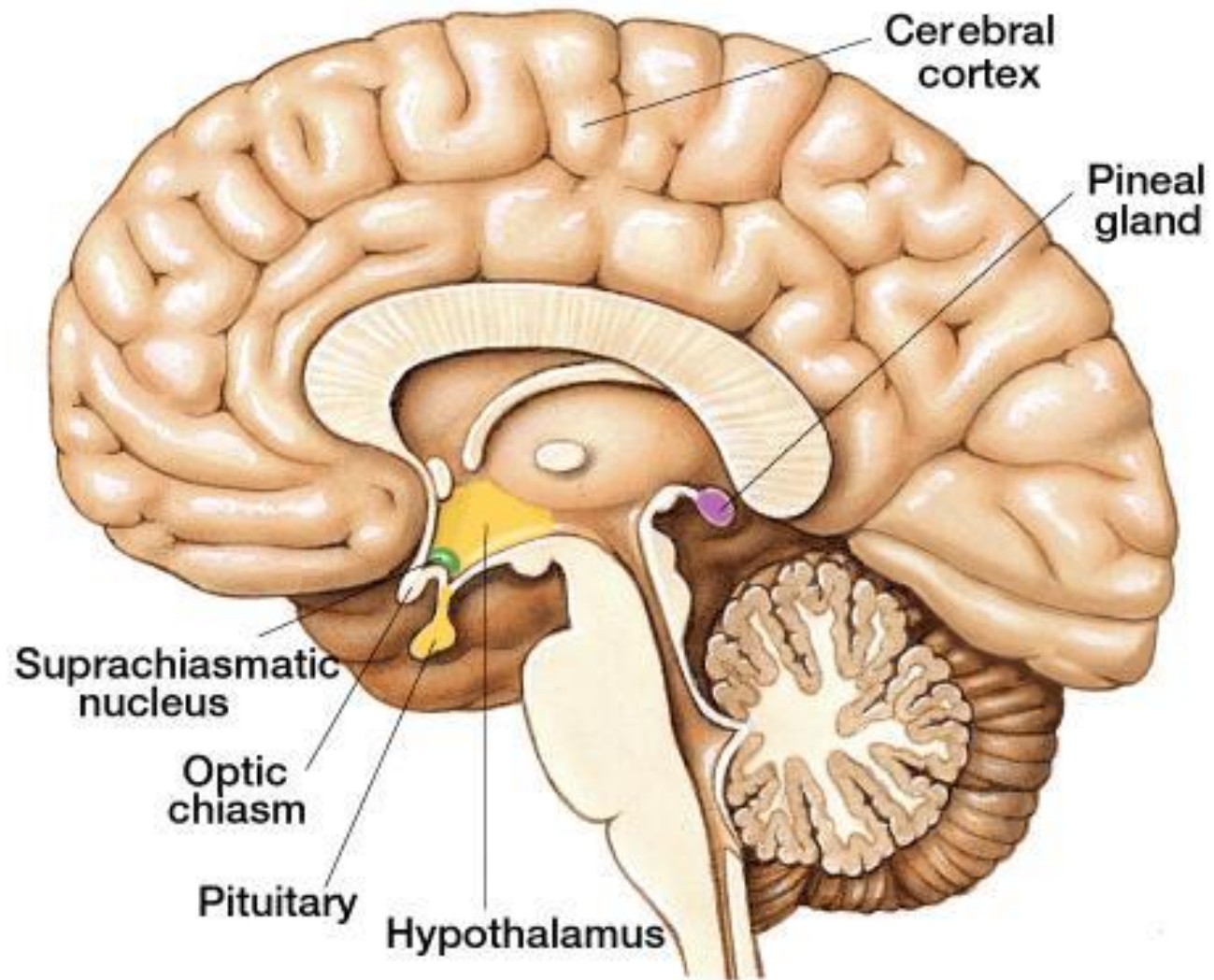


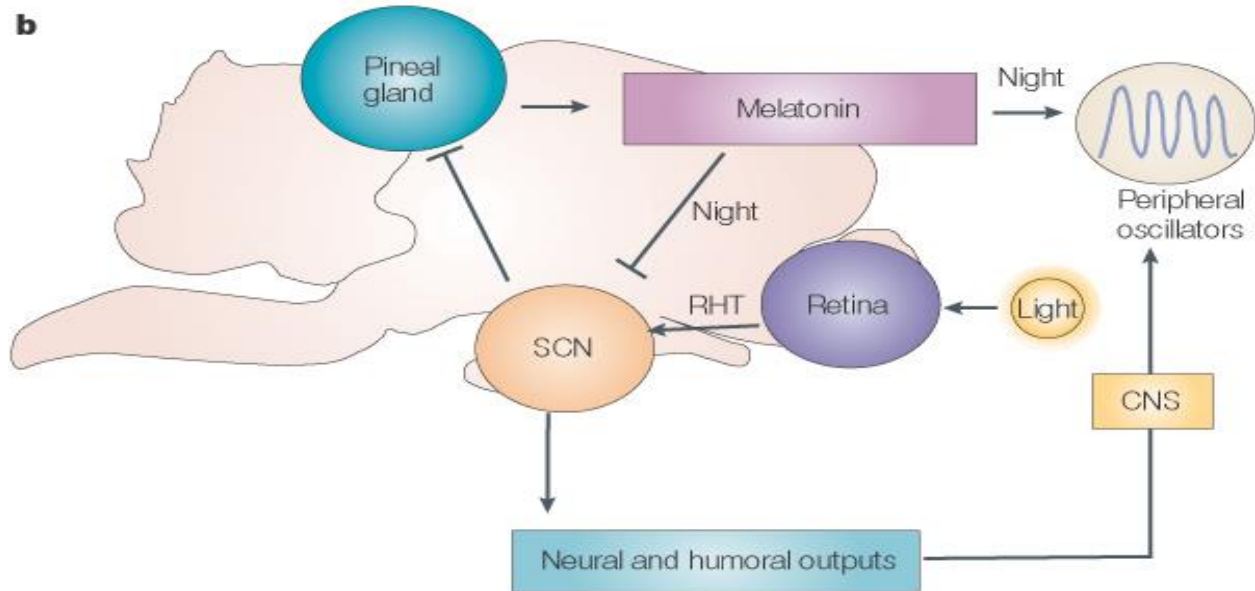
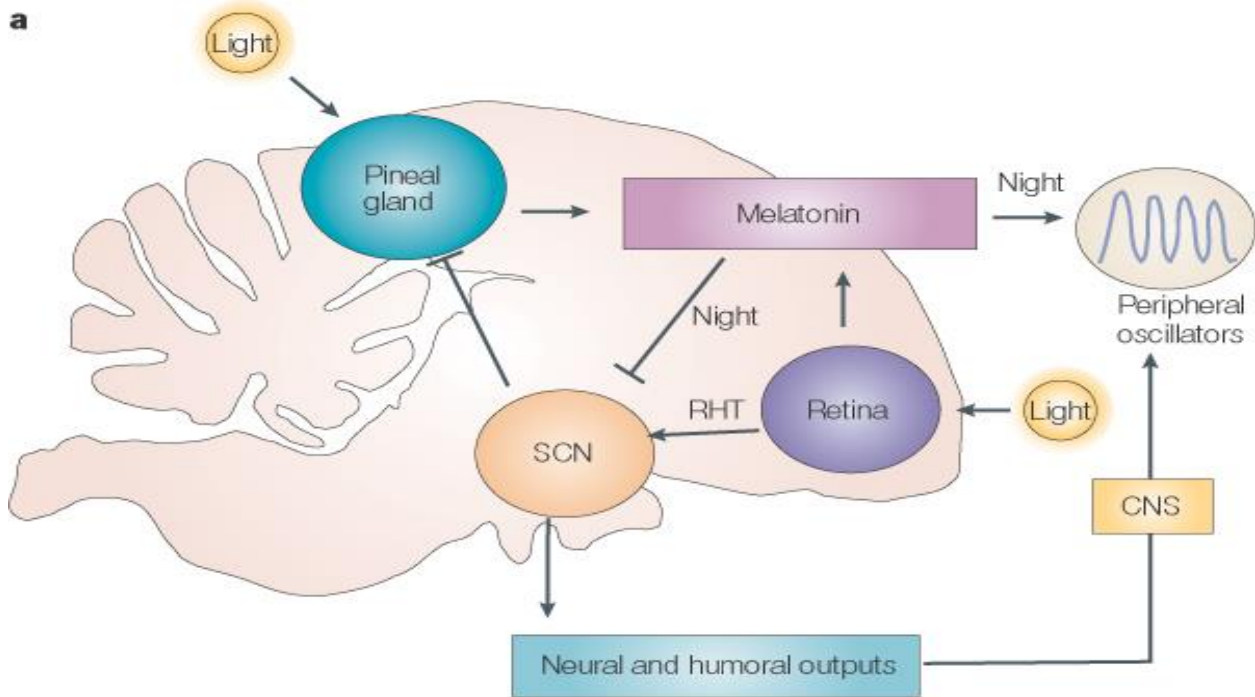
# Hormones of the adrenal gland



- Cholesterol derived hormones
  - Mineralocorticoids (Aldosterone)
    - Conservation of  $\text{Na}^+$  and  $\text{H}_2\text{O}$ ,  $\text{K}^+$  elimination in kidney
  - Glucocorticoids (Cortisol)
    - Gluconeogenesis, water excretion, blood glucose, gastric acid se, facilitate lipolysis
  - Sex steroids

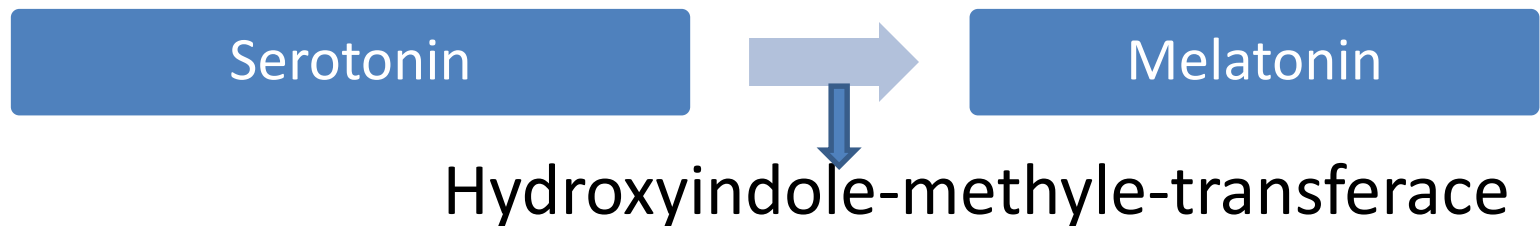
- 2 Control Systems
  - ACTH
  - Renin- angiotensin- Aldosterone





- **Pineal body**

- Located above the thalamus
- Contain high amount of serotonin & an enzyme



- Amount of the day light
  - synthesis of melatonin & it's release
- Melatonin - at night → sleepiness
- Serotonin - at day time → wake up

## – Functions

- Role in reproduction (change LH & FSH)
- Important for seasonal breeders



- **Pancreas**

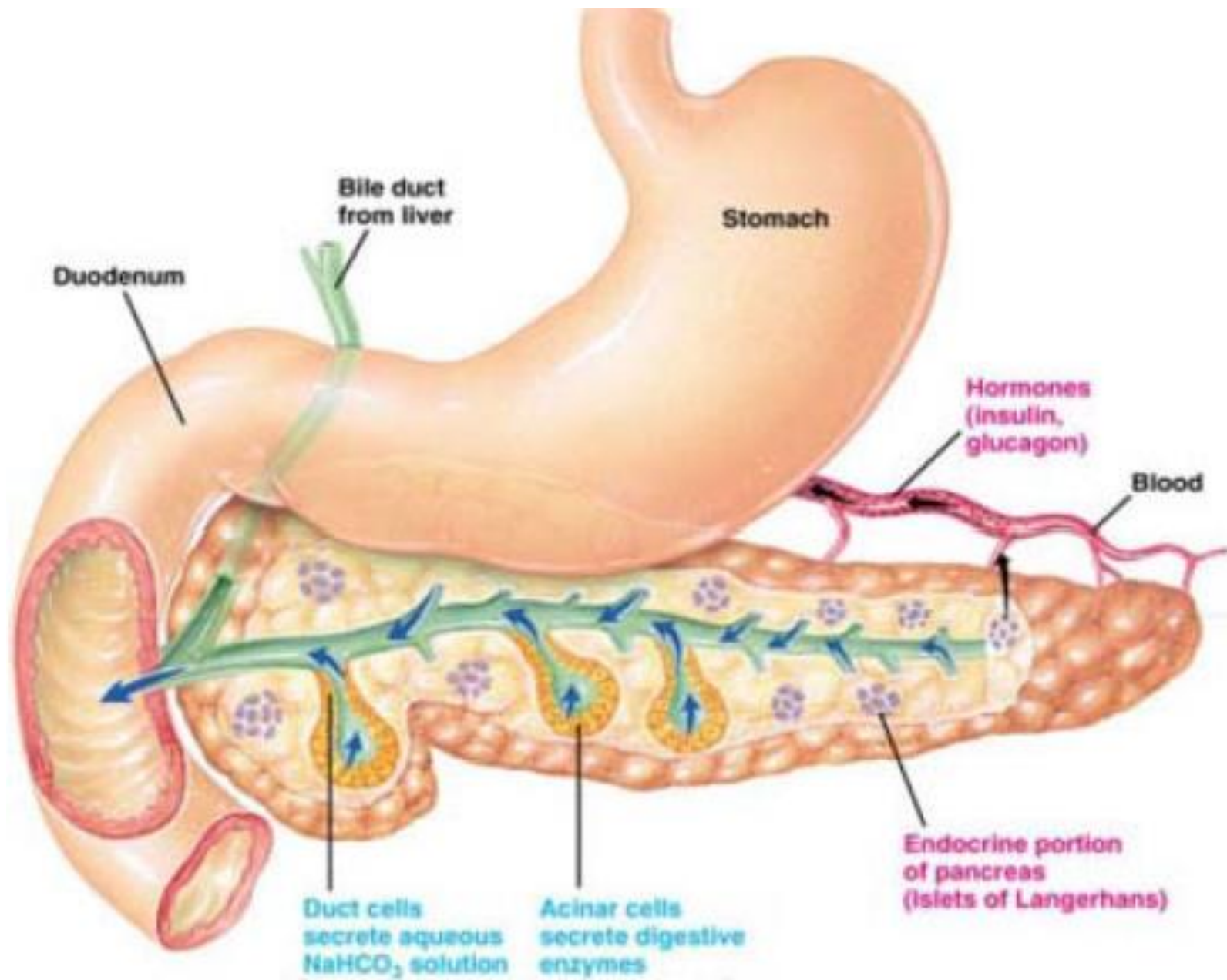
- Mixed gland (endocrine & exocrine )

- \*Islets of Langerhans cells produce 3 hormones

- **Insulin** – reduce blood sugar

- **Glucagon** - increase blood sugar

- **Somatostatin** – inhibits insulin & glucagon secretion



- **Thymus**

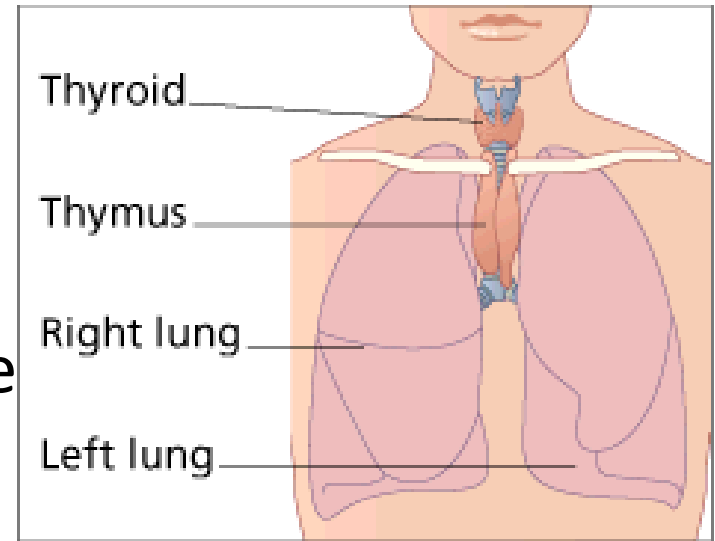
- Triangular /Y shaped

- Composed of lymphoid tissue

- Location → superior to lungs

- Composed of lobes loosely joined together by connective tissue

- Reaches maximum size during puberty & stopping growth with maturity



- Secretes -
  - Thymosin, Thymic humoral Factor (THF), Thyme factor, Thymopoietin, Lymphocyte Stimulant hormone (LSH)
- Functions
  - Hormonal factor is transported to stem cells in the lymphoid tissues & programs them to produce lymphocytes (immunology )
  - Hormone differentiates lymphocytes into plasma cells which produce Ab.